Introduction to the Internet

Presented by the MU-SPIN Project

at

Network Resources and Training Site

Workshop

Introduction to the Internet

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Introduction

- The Internet is a collection of world wide interconnected computer networks utilizing a protocol called Transmission Control Protocol /Internet Protocol (TCP/IP) to exchange vast amounts of on-line information.
- Information from Archeology to Zoology that once took years to published is now being made available within a few days to a month.
- Internet is becoming a household name.
- Other networks worldwide that provide on-line services are collapsing into the gravitational pull of the Internet.

History of the Internet

- 1957 - In response to the Soviet Union's launch of an artificial intelligence satellite, the U.S. under President Eisenhower formed the Advanced Research Projects Agency (ARPA) to avoid being left behind.
- 1964 - Paul Baran, of the RAND Corporation, published a report proposing a sufficiently decentralized network technology capable of surviving loss of links and/or nodes (computers) in case of a nuclear war. A new technology called packet switching was invented to divide data into small pieces and switch them through different routes to reach their destinations.
- 1966/67 - Rudimentary electronic mail was invented on single timesharing computers.
- 1968 - The first packet switching network was implemented at the National Physical Laboratories (NPL) in the United Kingdom (U.K.).

History of the Internet (cont'd)

- 1968 - ARPA funds the ARPA Computer Network (ARPANET), partly to permits researchers to share supercomputers. The ARPANET was an experiment in packet switching technology. The ARPANET was funded by the Military even though researchers did not agree with Baran's cold war scenario.

- 1969 - The first ARPANET node was installed at UCLA and by the end of the year four nodes communicated from different geographic locations. The ARPANET was thus the first distributed packet switching network. The prime contractor for ARPANET was Bolt, Beranek, and Newman (BBN) of Cambridge, Ma. ARPA funds were channeled through the Navy and the node at UCLA was considered part of some sort of submarine welfare project. Serious ARPANET research at that time and for a decade afterwards often required a secret clearance.

- 1970 - BBN (Ray Tomlinson) in collaboration with other ARPANET researchers invented a program to send electronic mail across a distributed network. The first servers for early versions of the File Transfer Protocol (FTP) were written. The Mail program was widely distributed via FTP. N. Abrahamson and a team at the Univ. of Hawaii implemented a network that foreshadowed some basic techniques used in ethernet today.

History of the Internet (cont'd)

- 1971 - ARPANET has 13 hosts in January.
- 1972 - TELNET (remote login), FTP, and Mail became the main user application protocols of the early ARPANET. The same Big Three applications reigned as the most popular for the next twenty years. ARPANET demonstrated at the International Conference on Computer Communications (ICCC).
- Mid 1970s - Mail programs invented that could read and delete messages, and compose headers for new messages and replies. Users had to hand craft all headers with the earlier versions of mail programs.
- 1973 - Bob Metcalfe invents Ethernet, an inexpensive and flexible Local Area Network protocol, which was developed by XEROX and Digital Equipment Corporation. It and other networking technologies ensured that LAN technology would be wide spread .
- 1974 - BBN deploys TELENET, a public data network (PDN) based on ARPANET technology. Mailing lists were invented on the ARPANET.

History of the Internet (cont'd)

- **1975 - The ARPANET was so successful that ARPA doesn't consider it research anymore and hands operational authority over to the Defense Communication Agency (DCA). DCA is now know as DISA, the Defense Information System Agency. There are 63 hosts estimated to be on ARPANET.**

- **1976 - International explosion of Networking and Birth of Internet**

  - **CCITT (International Consulative Committee on Telephony and Telegraphy) approves the first guidelines for X.25, Packet Switch Network.**
  - **XEROX establishes the XEROX Internet, using XEROX Network Services (XNS). The standards for the popular protocol were never published outside of XEROX nor encouraged outside input, and therefore TCP/IP took over. XNS lives on via Novell Netware.**
  - **Mailing lists became more popular and were used heavenly among working groups that specified the Internet protocols.**
  - **Many other proprietary network protocol suites such as SNA (IBM's Systems Network Architecture), DNA (Digital's Digital Network Architecture better known as DECnet), and so on.**

History of the Internet (cont'd)

- **1977 - The Experimental Internet begins to develop early experimental versions of the TCP/IP protocols involving researchers such as Vinton Cerf, Robert Kahn, and David Clark, and Louis Pouzin. These protocols were named for the two most prominent among them:**
  - **IP which permits communicates among different types of underlying network such as Ethernet,Token Ring, dedicated serial link, and etc.**
  - **TCP which provides reliable communications to end users (people or programs) across the IP datagrams.**
  - **Early versions of Open Systems Interconnection (OSI) were promulgated by CCITT.**
  - **Technical development of ISO-OSI and TCP/IP was int'l from the outset.**
- **1978 - UUCP (Unix to Unix CoPy Protocol invented at AT&T Bell Laboratories and distributed with successive versions of UNIX.**
- **1979 - USENET (User's Network) was invented by Tom Truscott and Steve Bellovin and deployed by Duke University and the University of North Carolina. USENET news was invented to imitate ARPANET's mailing lists. UUCP sent one copy of the message to host instead of each users.**

History of the Internet (cont'd)

- **1980 - The International Standard Organization OSI Reference Model was published. The split of OSI and TCP/IP networkers deepens.**

- **1981 - Emerging Networks**

  - **BITNET (Because It's Time Network) starts to connect computer centers worldwide using 9600 bps leased lines and the Network Job Entry (NJE) protocol emulates punch cards technology that delivers mail and file transfer services .**

  - **CSNET (Computer Science Network) established to provide ARPANET-like services to computer science departments without ARPANET access due to lack of related government grants. Unlike USENET, CSNET was designed and implemented by faculty and funded by the National Science Foundation (NSF). Provide some IP connectivity over X.25 (Packet Switch) links to some sites.**

  - **Teletel, commonly known as Minitel after the terminals that the France Telecom gave away throughout France to establish the Network is introduced. No telephone or national government has since been so bold, however, with personal computers emerging none has to.**

History of the Internet (cont'd)

- Early 1980s - Various hub and spoke networks sprung up to service specialized communities that could not at the time get on ARPANET. Reagan Administration changes the name of ARPA to DARPA to emphasize its defense role.

- 1983 - Major changes in ARPANET

  - All ARPANET hosts were required to use TCP/IP for communications.
  - ARPANET splits into two networks. One was MILNET, which was reverted back to more or less operational Military uses. The other was the ARPANET which became the research backbone.
  - The Internet was basically a different kind of network from ARPANET because it allowed for a heterogeneous network computing environment with IP as the common overlying protocol.
  - UNIX (4.2BSD) was released to standardize an operating system for DARPA research and support for TCP/IP.
  - Inexpensive microprocessors such as the Motorola 68000 was introduced.
  - European Academic and Research Network (EARN) was established on the model of and interconnected with BITNET.
  - ARPANET now has an estimated 562 hosts.

History of the Internet (cont'd)

- **Mid 1980s**
  - DARPA's Internet became the Federal Research Internet to acknowledge the participation and funding of many different U.S. government agencies, including DARPA, DCE, NASA, DoE, and NSF.
  - Many widespread distributed networks such as HEPnet, PHYSNET, and MFEnet spread rapidly using a variety of protocols (HEPnet, DECnet, MFE)
  - Japan UNIX Network (JUNET) was established using UUCP for mail and USENET.
- **1984 - NSF expands its interest in networking and arguments for the NSFNET to connect supercomputer centers were published.**
- **1985 - NSF funds the first five national supercomputer centers as well as a dozen or two regional networks which are intended to interconnect with a national NSFNET backbone.**
- **1986 - Domain Name Service became widespread network service. Network News Transfer Protocol (NNTP) specified for efficient transmission of USENET news over TCP/IP. NSFNET backbone was implemented using 56kbps leased lines and connects to Internet.**

History of the Internet (cont'd)

- 1987 - NSF agreed that Merit, Inc. would manage the NSFNET backbone in cooperation with MCI and IBM. First and second Interoperability Conference for TCP/IP held. UUNET, the first organization to sell UUCP and USENET access, became with initial funding from the USENIX Association. UUNET later became independent and provided IP connectivity to the community.

- 1988 - NSFNET T-1 (1.544Mbps) backbone became operational. There are 56,000 hosts estimated to be on the Internet. Focus of funding shift from government to privatization, from resource sharing to resource discovery, from academic and research networks to the beginnings of a global multipurpose network. The Morris worm infests the Internet bringing national attention to the Internet. The author is later convicted, breaking the Internet tradition of absorbing potentially malicious uses.

- 1989 - NSF specifies its Acceptable Use Policy, which essentially says the Internet Backbone shall only be used for research or education, or in support of research or education. There are 80,000 hosts estimated to be on the Internet.

History of the Internet (cont'd)

1990 - Year of technological changes

- NSFNET T-3 (45Mbps).
- 1990 - BITNET uses shrunk with segments transitioning into the Internet.
- The ARCHIE indexer of anonymous FTP archives was invented by McGill University. There are 188,000 hosts estimated to be on the Internet.
- ARPANET decommissioned because its hardware and link speeds have became technologically obsolete.

1991 - The Year of Europe

- There are 376,000 hosts estimated to be on the Internet.
- European Unix Network (EUNET), originally a UUCP provider, decided to commercialize and incorporates Internet the next year.
- Senator Al Gore and the Bush Administration backed and Congress approved the High Performance and Computing Act which provided initial funding for the National Research and Education Network (NREN).
- Beginning of Internet search engines development such as Wide Area Information Servers (WAIS), Gopher, World Wide Web (WWW), and the emergence of the term Resource Discovery.

History of the Internet (cont'd)

1991 - The Year of Europe (cont'd)

- Gopher was invented at the University of Minnesota.
- EBONE initiative began, independently of any government funding with the intent of building an international IP backbone for Europe
- Independent commercial IP providers formed the Commercial Information Exchange (CIX) and began transferring traffic among their customers with government funded intermediary.

1992 - The Year of Gopher

- There are 727,000 hosts estimated to be on the Internet.
- Gopher traffic increased approximately sixfold, leaving traditional services such as FTP behind (in growth rate; not in absolute traffic).
- Poland, Czechoslovakia, Hungary, and Estonia connected in the Internet with permission to use the NSFNET backbone. Russia connected via dialup IP thorough CIX.
- NSFNET T-3 (45Mbps) backbone implementation completed.
- EBONE completed forming a Pan-European IP backbone without significant government backing and/or funding.

History of the Internet (cont'd)

1993 - The Year of Mosaic and World Wide Web (WWW)

- There are 1,313,000 hosts estimated to be on the Internet.
- Information transferred via WWW increased by a factor of 2200 (220,00 percent) and packets by 1600 times (160,000 percent) in one year over the NSFNET.
- By providing a common but native interface on DOS, Windows, Macintosh, and UNIX systems to a variety of Internet information resources browsers such as Mosaic and Netscape took WWW from being an also ran service to the most dynamic on the Internet.
- The White House and the House of Representatives connected to the Internet.
- A consortium of industry figures proposes a National Information Infrastructure (NII) emphasizing voice and video.
- Commercial IP access established in Japan with international IP connectivity to the global Internet via IIKK and AT&T.
- Surveys indicates 5.7 millions with Internet access.

History of the Internet (cont'd)

- 1994 - There are 2,217,000 hosts estimated to be on the Internet.
- 1994 - Network and Interop conferences worldwide hosted with 150,000+ in attendance.
- 1994 - WWW traffic continues to grow but not as fast as 1994 and is second only to FTP in traffic volume across NSFNET.
- 1995 - There are 4,852,000 hosts estimated to be on the Internet.
- 1995 - USENET users are estimated to by about 16.5 millions.
- 1995 - Acquisition of IP services and/or integration of Internet applications by Prodigy, America On-line, and Microsoft became available.
- 1996 -Communications Decency Act enacted into law, heavily regulating the Internet. A federal judge blocked enforcement of the act.
- 1996 - President Clinton announces his “Technology Literacy Challenge”, stating that “by the year 2000 every classroom and library in the entire United States be hooked up to the Information Superhighway”

THE INTERNET

- Provides access to a variety of scientific facilities inclusive of: digital libraries, unique databases, high performance computing platforms, remote sensed scientific data, animation, and research/education collaborators.
- Promotes research/education interaction and collaboration with a single well-integrated published standard connecting end users using TCP/IP.

Growth of the Internet

- 1981 - 213 users
- 1989 - 80,000 users
- 1990 - 313,000 users
- 1992 - 727,000 users
- 1993 - 1,313,000 (estimated)
- 1994 - 2,217,000 (estimated)
- 1995 - 6.6 million users
- 2000 - 180 million users (estimated)

INTERNET ADDRESSES

- Is Made up of various parts similar to a U.S. Postal address.

- Has two forms, one which is numeric (this is known as the IP address) and another which is mnemonic (known as the host name).

  - 128.183.15.054 is the MU-SPIN file server's IP address
  - muspin.gsfc.nasa.gov is the mnemonic address
    - muspin - is the local nodename of the computer
    - gsfc - is the organization unit (Goddard Space Flight Center)
    - nasa - is the organization (National Aeronautics Space Administration
    - gov - is the Internet domain (gov for government agency)

INTERNET RESOURCES

- Discussion Lists
- On-line databases
- Public Domain Software
- Usenet

DISCUSSION LISTS

- **How to find:**
  - **To: listserv@dartcms1.dartmouth.edu**
    Subject: [BLANK]
    Text: send listtext package

- **To Subscribe to a Discussion send e-mail**
  - **To: <discussion group e-mail address>**
    Subject: [BLANK]
    Text: SUBSCRIBE <group-name> <your real name>

- **To Cancel your Subscription**
  - **Text: UNSUBSCRIBE <group-name> <your real name>**

PUBLIC DOMAIN SOFTWARE

- **University of Michigan software archives: public domain Mac, IBM PC, Apple II, NeXt software.**

  ftp archive.umich.edu

  For archive info, send e-mail to:

  archive-request@archive.umich.edu

- **Macintosh public domain archive at Stanford University.**

  ftp sumex-aim.stanford.edu

  cd info-mac

  For help, send e-mail to

  info-mac-request@sumex.aim.stanford.edu

ON-LINE DATABASES

- **National Science Foundation Information Service**
  - telnet stis.nsf.gov
  - login as public
  - terminal type of vt100nkp
- **NETFIND**
  - telnet bruno.cs.colorado.edu
  - login as netfind
- **Geographic Name Server**
  - telnet martini.eecs.umich.edu 3000

USENET NEWS

- Usenet news is a world-wide distributed discussion system.
- It consists of a set of newsgroups with names that are classified by subject.
- Its available on a variety of computer systems and networks, but the bulk of the traffic is transported utilizing the Internet or UUCP.

THINGS TO REMEMBER WHEN USING USENET

Etiquette

- Don’t forget the person on the other side is human.
- Can’t blame system administrators for users’ behavior.
- Be careful what you say about others.
- Always be brief.
- Your postings reflect upon you, be proud of them.
- Use descriptive information in your subject line.
- Think about your audience!
- Limit your line length and don’t use control characters.

ELECTRONIC MAIL

- Also known as e-mail
- Used to:
  - send and receive messages
  - participate in discussions
  - request and receive information
- The best way to find someone's e-mail address is to ASK THE PERSON!!!

FORM OF ELECTRONIC MAIL

- An e-mail address has the form user@destination.
- An example address is user@localnode.gsfc.nasa.gov

• user	users login id
• @	separates the username from the node address
• localnode	the name of the computer
• gsfc	the organization unit (Goddard Space Flight Center)
• nasa	the organization (National Aeronautics Space Administration)
• gov	Internet domain (gov for government agency)

FILE TRANSFER PROTOCOL

- Also known as FTP.
- The Internet standard protocol for transferring ascii(text based) and binary(programs) files.
- Used for transferring files over the network between heterogeneous systems supporting the standard.

ANONYMOUS FTP SITES

- **Very popular.**
- **Set up to to provide files for public access and retrieval.**
  - **Free software**
  - **Electronic books**
  - **Documentation**
  - **Maps**
  - **Graphics**
  - **High-tech images**
  - **Sound**

TELNET

- Allow users to access public resources on a computer at another site.
- Allow users to be interactive with resources on remotely located computer systems.
- Allow users to connect to bulletin boards, campus-wide information systems, libraries, supercomputers, databases, and other resources worldwide.

GOPHER

- Distributed document search and retrieval system.
- Browsing a hierarchical collection of menus.
- Recipes, campus-wide information, sound, pictures, weather, etc.
- It lets you browse through the Internet's resources without having to remember names, addresses, commands, etc.

Web Browsers

- Networked information discovery, retrieval, and collaboration using GUI (graphical interface with point and click intuitive interface using a mouse)
- Provides a hypertext interface to the global Internet.
- Client communications using the HyperText Transfer Protocol (HTTP) to the servers. Newer client software incorporates the functions of network services such as FTP, Gopher, WAIS, and NNTP (Usenet News).
- Documents viewed are written in HyperText Markup Language (HTML).
- Features unlimited multimedia capabilities (Graphics, sound, movies, etc).

BROWSER CAPABILITIES

Some of the features include:

- display of plain text, rich text, and hypermedia,
- inline graphics,
- a customizable graphical user interface,
- global history of information space navigation -- tracking where you've been.
- quick access to important or frequently used documents via a personal "hotlist",
- search capabilities within a document,
- text and voice annotation for documents anywhere on the Internet,
- full TCP/IP-based communications support,
- easily extendible to arbitrary viewers or other data formats.